Precipitation associated with extra-tropical cyclones: response to uniform global warming and to polar amplification

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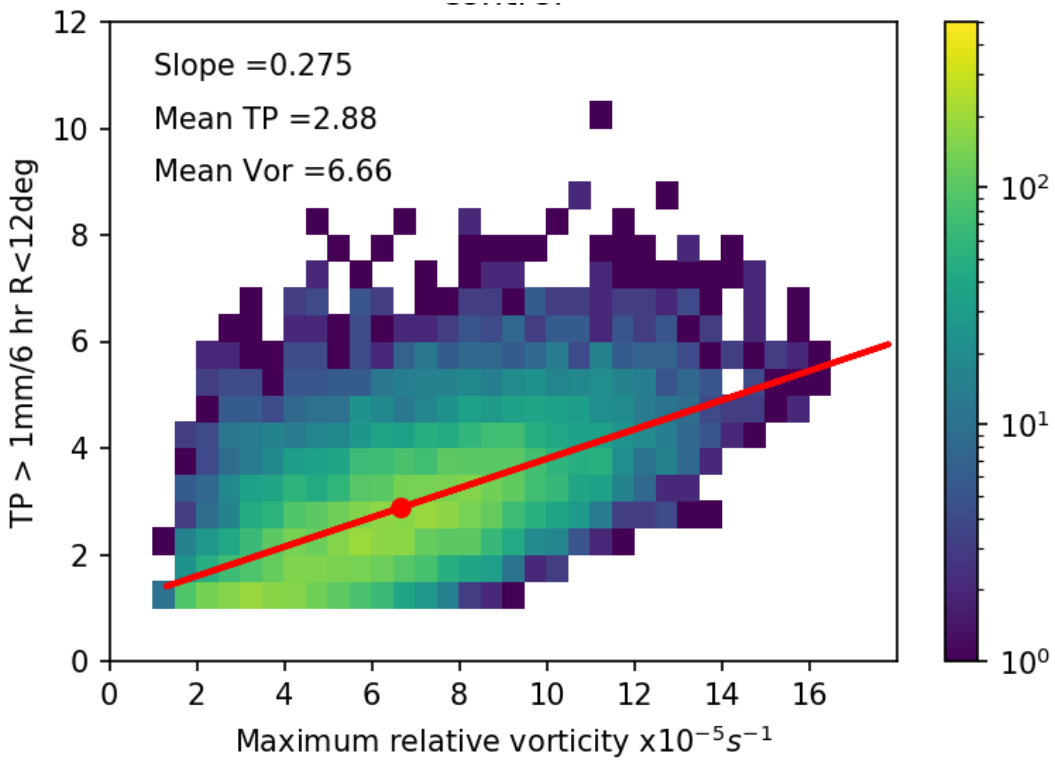
BACKGROUND: Stronger extra-tropical cyclones have more precipitation



2D histogram – shading shows the number of cyclones. From the control simulation.

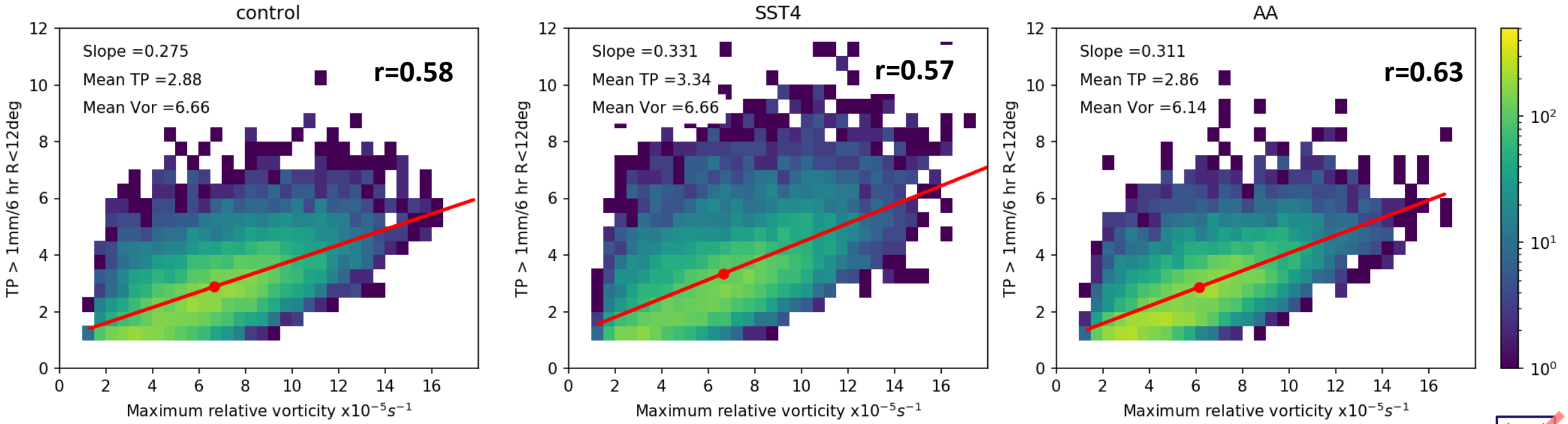
QUESTIONS: How will this relationship between dynamical intensity and precipitation change with warming and polar amplification?

Does this relationship differ for different types of extra-tropical cyclones?

METHODS: Three 10-year long aqua-planet simulations with OpenIFS with different SSTs.

TRACK: locate all extra-tropical cyclones (> 10,000 per experiment)

k-means clustering: find different types of cyclones



CONCLUSION 1: Uniform warming and Polar amplification: same increase in cyclone intensity, bigger increase in precipitation compared to ”current” climate -> steeper slope.

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CONCLUSION 2: Only 2 out of the 4 cyclone types have a strong relationship between cyclone intensity and cyclone precipitation

The distributions of the gradient of the best-fit line between maximum vorticity and precipitation (“slope”) obtained from bootstrapping. 4 different cyclone types as identified by k-means clustering. CONTROL experiment

